SHOVELNOSE STURGEON IRIDOVIRUS SAMPLING IN THE MISSOURI RIVER, BELOW GAVINS POINT DAM, SOUTH DAKOTA AND NEBRASKA

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INTRODUCTION

Numerous sturgeon species have been integral components of significant fisheries within North America. Species of sturgeon have played an important historical role in recreational and commercial fisheries of various riverine and Great Lakes communities throughout the United States. Present commercial fisheries for sturgeon species are virtually non-existent, in part due to overexploitation, coupled with an inherently long period of time for sturgeon species to become sexually mature.

Two species within the Missouri River basin (pallid sturgeon, *Scaphirhynchus albus*) and shovelnose sturgeon, *Scaphirhynchus platorynchus*) have been recently found to harbor a suspect virus (currently being referred to as the Missouri River Sturgeon Iridovirus, or MRSIV), very similar to but different from the White Sturgeon Iridovirus (WSIV). Currently, MRSIV, has been detected only in captive propagated sturgeon in Service facilities and in wild shovelnose sturgeon collected in the Missouri River below Ft Peck. Both shovelnose and pallid sturgeon have been diagnosed with the iridovirus agent. In USFWS Region 6, three Service facilities have cultured sturgeon in which the iridovirus was detected: Gavins Point National Fish Hatchery, Valley City National Fish Hatchery, and Garrison Dam National Fish Hatchery.

Current information regarding the significance of the iridovirus in Missouri River sturgeon species is lacking in the following areas: a) its host and geographic range in wild populations, b) its transmissibility to other species of sturgeon and the question of vertical transmission from parents to progeny, c) the utility of existing sturgeon cell lines and primary cell cultures, and d) applicable diagnostic and monitoring procedures for both latent and patent infections.

Pallid sturgeon are Federally listed as an endangered species, not legally catch-able and subject to a multi-agency recovery effort. The current recovery plan calls for supplemental propagation programs to provide absolutely essential recruitment in the Upper Missouri River basin where natural recruitment is non-existent and has been so for over 20 years. Without releasing hatchery propagated sturgeon into the wild, to pass on the gene pool from the aging pallid sturgeon population, the species will become extinct in the upper basin. Service facilities in Region 6 have implemented culture programs and management activities to assist in the recovery effort. The intensive culture of the pallid and shovelnose sturgeon presents fish health concerns. As with most fish pathogens, the iridoviral agent can be associated with mortalities in cultured sturgeon but has not been identified as a mortality factor in the wild.

The significance of the iridoviral agent in shovelnose and pallid sturgeon is not entirely known, primarily as a function of our lack of knowledge regarding the epizootiology and life cycle of the viral agent. Management decisions relative to both species, must be based on good science with regard to pathogen detection and significance. Improved management decisions can be made if we have a good understanding of the naturally occurring presence of this virus in wild populations of both species. Lack of thorough information is currently resulting in management decisions that err on the side of caution regarding stocking of positive or suspect sturgeon. In the not too distant future, decisions will need to be based on the need to prevent extinction of the species as the wild population continues to age toward senility and death.

The Upper Basin Pallid Sturgeon Work Group identified iridovirus sampling as a priority activity for continuing pallid sturgeon recovery in the Missouri River. Our sturgeon collections and iridovirus sampling are being conducted to meet this goal.

STUDY AREA

Gavins Point Dam is located at Yankton, South Dakota and is the most downstream main-stem dam on the Missouri River (Figure 1). This section of the river is one of the pallid sturgeon Recovery Priority Management Areas and the focus area for this iridovirus sampling effort.

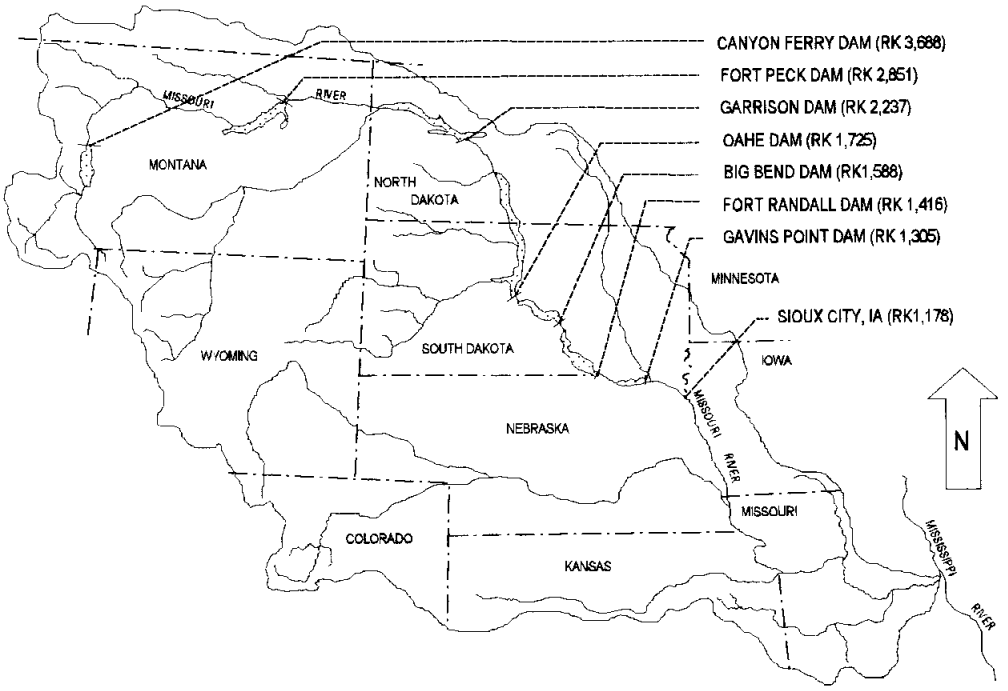

Figure 1. Missouri River Basin with main-stem dams.

Our study area included the Missouri River from below Gavins Point Dam to 1 km below the Clay County boat ramp (figure 2). This stretch of river resembles the natural Missouri River and contains sand bars, old growth riparian forest, side channels and year round flows. Although the natural hydro graph has been greatly altered due to water releases from Gavins Point Dam, the fish assemblage more closely resembles that of the historical Missouri River.

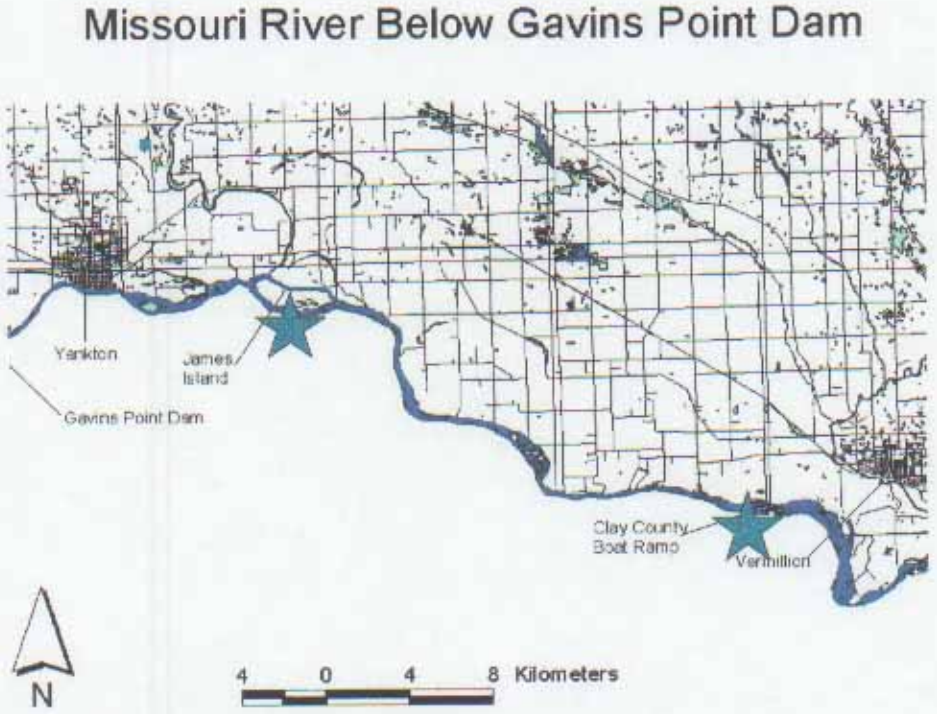

Figure 2. Study area for shovelnose sturgeon iridovirus study. Areas with stars represent approximate sturgeon collection sites.

METHODS

Sturgeon Collection Methods

Shovelnose sturgeon were collected at two areas (Figure 2) and two sites within each area (Figures 3 and 4) between July and September 2001.

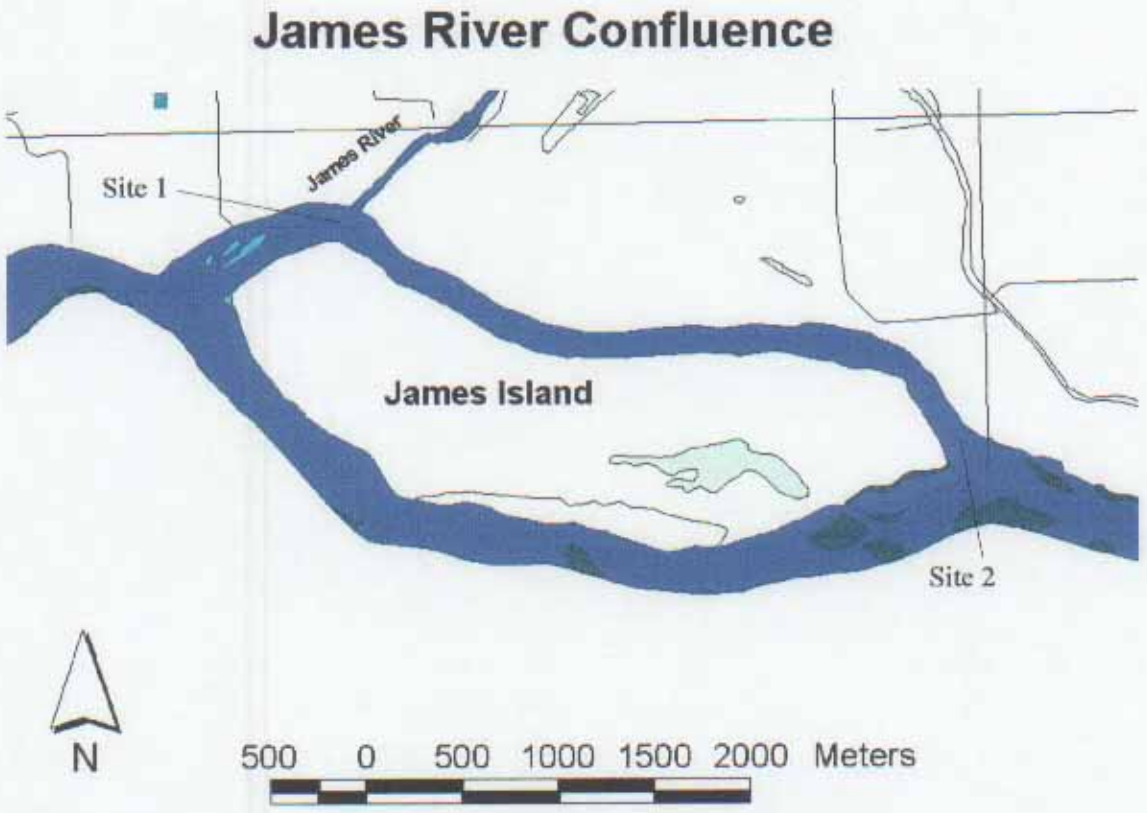

Figure 3. Shovelnose sturgeon collection sites near the Missouri River-James River confluence.

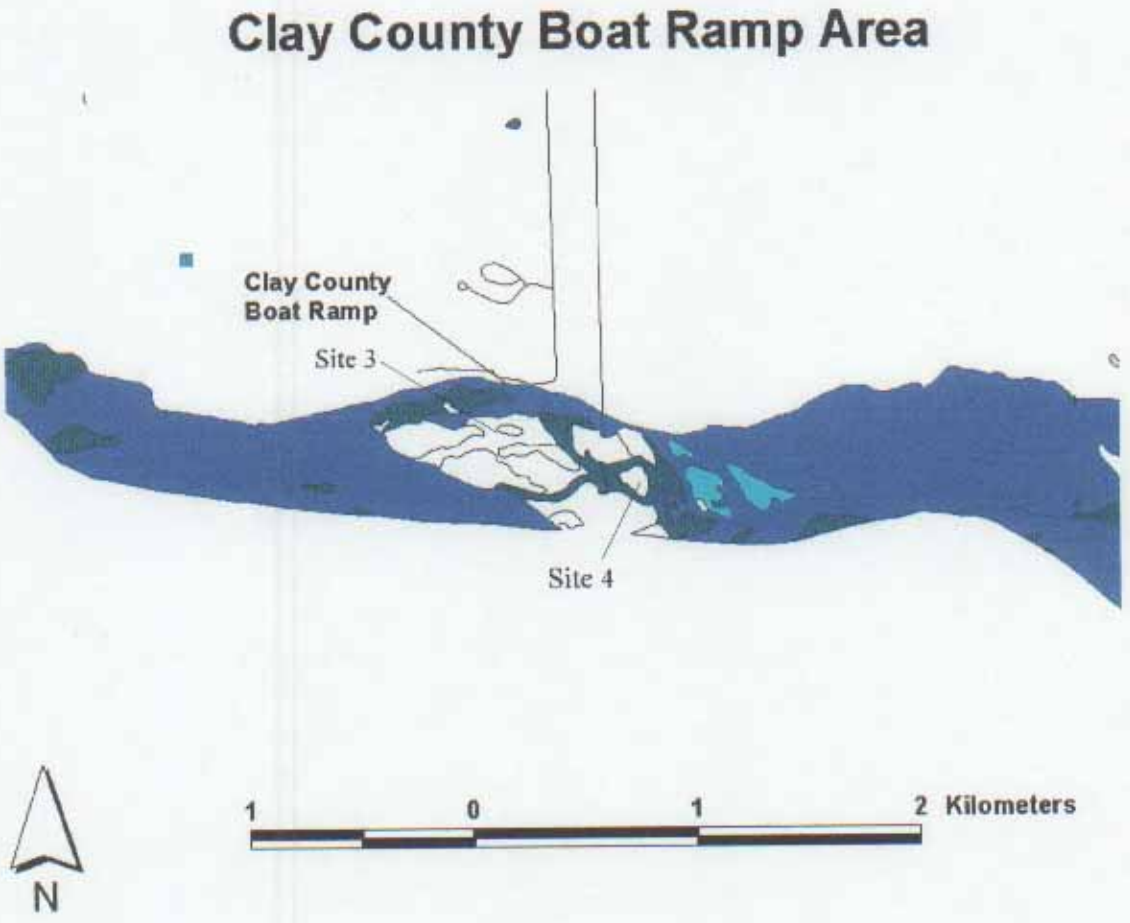

Figure 4. Shovelnose sturgeon collection area near the Clay County Boat Ramp, South Dakota.

Shovelnose sturgeon were collected using 24-hr gill net sets, floating trammel nets, and hoop nets. The experimental gill nets were 38.1 x 1.8 m monofilament experimental nets consisting of five 8.3 m panels (19 mm, 25 mm, 38 mm, 51 mm, and 76 mm) mesh. The experimental floating trammel nets were 30.58 m long x 1.83 m high. Each net consisted of four 8.3 m long panels, each panel being randomly placed with a different wall size: bar mesh size (30.58 cm: 2.54 cm, 35.56 cm: 5.08 cm, 40.64 cm: 7.62 cm, and 45.72 cm: 10.16 cm). Trammel nets were floated through areas with flow: sandbars (channel side), plunge pools, and river channel. Areas too small for a 15 minute drift (e.g. plunge pools, sandbars) were floated repeatedly until the time requirement was met. If a net became filled with debris, the drift and timing was stopped until the materials were removed.

Trammel nets and gill nets were also set stationary in areas without flow: flats and backwater side of sandbars. Three nets were set for 24-hr each in both habitat types. A 100 m long x 4 m high seine with a 2.54 cm bar mesh was used as a secondary gear type in areas of low flow. Three seine hauls were performed in each habitat type, with each haul having the same area covered. For all sampling, habitat type, depth, and temperature were recorded. Total length was measured to the nearest millimeter for each fish.

Non-Lethal Sampling and Collection Techniques:

The initial detection of an iridoviral agent in cultured shovelnose and pallid sturgeon prompted the development of specific guidelines for health sampling. Due to the tropism of the Iridovirus for epithelial cells, it is extremely important to handle fish samples delicately. All samples were handled to ensure that skin surfaces had as little contact with equipment and sampling surfaces as possible.

We removed approximately 0.75 - 1.0 cm^2 sample of the pectoral or similar area (Figure 4) using scissors and placed the fin into a tube of Davidson's solution for 48-hrs. Each sample was then decanted and refilled with 70% Ethyl Alcohol. From each fish we also removed approximately 5 mm^2 of pectoral fin using scissors and placed the fin into 1.5 ML micro tube with Buffer ATL. Each sample was recorded on the tube with a number corresponding to a fish number on the National Wild Fish Health Survey Submission Form. All samples were kept on ice in the field until they could be froze for long-term storage. The 50 samples were then forwarded to the Bozeman Fish Health Center for fish health screening for irridovirus using histology and Polymerase Chain Reaction (PCR) analysis.

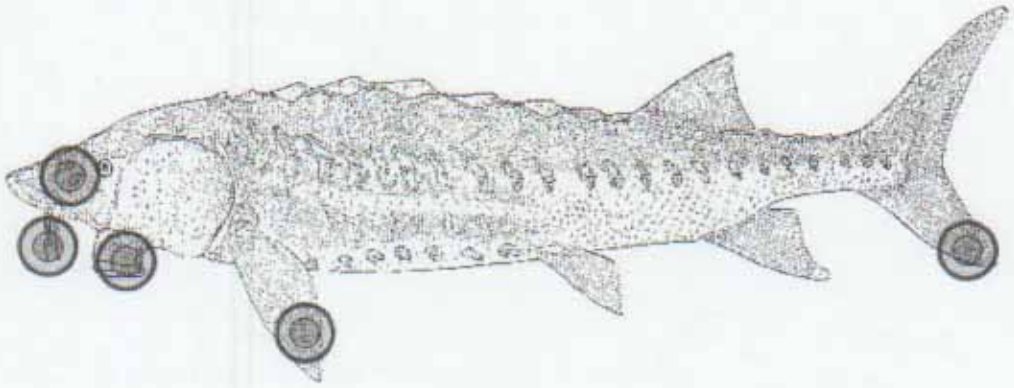

Figure 4. Sampling sites for shovelnose sturgeon iridovirus.

Laboratory Protocols:

Histology

Presumptive Diagnosis is based on the observation of clinical signs characteristic of the disease, and isolation of the causative agent. Fifty shovelnose tissue were prepared using standard histology processing techniques involving a series of dehydration steps to remove water facilitating paraffin embedment. Fin clips were then embedded in paraffin blocks. The blocks were thin sectioned on a microtome and each section placed on a slide and stained. Both Haematoxylon/eosin and giemsa staining were completed. The stained slides were examined using light microscopy. Epithelial cells were examined for the presence of viral infection.

Polymerase Chain Reaction

The genetically based Polymerase Chain Reaction (PCR) test is being used to look for viral DNA specific for iridoviruses of sturgeon. The newly designed primers (prepared at the University of California at Davis), will look for those iridoviruses previously identified in juvenile pallid and shovelnose sturgeon. Currently a rigorous comparison of the PCR test and histological examination is being conducted on a group of 700 pallid sturgeon samples. This validation study is being conducted as a joint project with the U.S. Fish and Wildlife Service Bozeman Fish Health Center and the University of California at Davis. The results of the validation tests are expected in March, 2002.

Upon completion of the validation study, the Bozeman Fish Health Center will be conducting screening work for free-ranging pallid and shovelnose sturgeon. At that time, the sturgeon samples submitted as part of this study will be promptly screened by the PCR method.

RESULTS

Fifty shovelnose sturgeon were collected from the Missouri River between Gavins Point Dam and the Clay County Boat Ramp and non-lethally sampled using the protocol described in the Pallid Sturgeon Recovery Plan and the US Fish and Wildlife Service- Region 6- Fish Health Policy. Histological examination at the Bozeman Fish Technology Center was negative for signs of irodivirus. The Polymerase Chain Reaction (PCR) tests are being validated at the University of California at Davis and the samples collected for this project will be completed during March, 2002.